

AMENDMENTS TO THE CLAIMS

Please cancel claims 37 through 41 without prejudice. Amend the remaining claims as shown in the following complete listing of all the claims.

1.(Original) An apparatus for excluding ferromagnetic and magnetic objects from proximity to an MRI instrument, comprising:

an array of sensors adapted to sense a magnetic field of an object;

a processor adapted to interpret signals from said sensor array sensing said magnetic field to detect said object; and

a scanner chassis on which said sensor array is mounted, said scanner chassis being adapted to position the entirety of said sensor array in proximity to all portions of a human subject, said scanner chassis being adapted to orient said sensor array to distinguish between a background magnetic field and said magnetic field of said object.

2.(Original) The apparatus recited in claim 1, wherein:

said object is a “soft” ferromagnetic object; and

said magnetic field comprises an induced magnetic field caused by magnetization of said ferromagnetic object by an external magnetic field.

3.(Original) The apparatus recited in claim 1, wherein said object comprises a permanently magnetic object.

4.(Original) The apparatus recited in claim 1, wherein said processor is further adapted to interpret signals from said sensor array sensing said magnetic field to characterize said object.

5.(Original) The apparatus recited in claim 1, wherein said processor is further adapted to interpret signals from said sensor array sensing said magnetic field to locate said object.

6.(Original) The apparatus recited in claim 1, wherein said scanner chassis comprises a portal structure, said portal structure having at least first and second vertical members, one of said vertical members being arranged on each side of a passageway adapted for passage of a recumbent human subject.

7.(Original) The apparatus recited in claim 6, wherein:
said sensor array comprises at least first and second sensor sub-arrays;
said first sensor sub-array is arranged horizontally on said first vertical member on a first side of said passageway;
said second sensor sub-array is arranged horizontally on said second vertical member on a second side of said passageway; and
said first and second sensor sub-arrays are positioned at a height matching a selected height at which said recumbent human subject will pass through said portal structure.

8.(Original) The apparatus recited in claim 6, wherein:
said portal structure further comprises a horizontal member spanning said passageway between said first and second vertical members;
said sensor array comprises at least one sensor sub-array arranged horizontally on said horizontal member; and
said sensor sub-array is arranged above said passageway, at a height above, but in close proximity to, a selected height at which said recumbent human subject will pass through said portal structure.

9.(Original) The apparatus recited in claim 8, wherein:

said horizontal member has a scanning position spanning said passageway at an intermediate height relative to said first and second vertical members, said scanning position limiting the clear height of said passageway between said first and second vertical members to said intermediate height; and

said horizontal member has a non-scanning position, said non-scanning position not spanning said passageway at said intermediate height, said non-scanning position increasing said clear height of said passageway to allow passage of an upright human subject through said portal structure.

10.(Original) The apparatus recited in claim 9, wherein:

said sensor array comprises at least three said sensor sub-arrays;

a first said sensor sub-array is arranged horizontally on said horizontal member;

a second said sensor sub-array is arranged vertically on said first vertical member;

a third said sensor sub-array is arranged vertically on said second vertical member; and

when said horizontal member is in said non-scanning position, said second and third sensor sub-arrays are adapted to scan said upright human subject passing through said portal structure.

11.(Original) The apparatus recited in claim 1, wherein said scanner chassis comprises a hand-held frame.

12.(Original) The apparatus recited in claim 11, wherein:

said object is a “soft” ferromagnetic object; and

said magnetic field comprises an induced magnetic field caused by magnetization of said ferromagnetic object by an external magnetic field.

13.(Original) The apparatus recited in claim 12, further comprising a source of said external magnetic field mounted on said hand-held frame.

14.(Original) The apparatus recited in claim 13, wherein said source of said external magnetic field comprises a permanent magnet.

15.(Original) The apparatus recited in claim 13, wherein said source of said external magnetic field comprises an electromagnetic coil.

16.(Original) The apparatus recited in claim 15, wherein said electromagnetic coil is driven by a DC source.

17.(Original) The apparatus recited in claim 15, wherein said electromagnetic coil is driven by an AC source.

18.(Original) The apparatus recited in claim 17, wherein said AC source operates at a frequency less than about 1000 Hz.

19.(Original) The apparatus recited in claim 13, wherein said sensor array comprises at least two sensors, said at least two sensors being arranged symmetrically relative to said magnetic field source, said at least two sensors being connected to cancel out their respective signals resulting from exposure to the flux of said magnetic field source.

20.(Original) The apparatus recited in claim 19, wherein said at least two sensors comprise induction coils.

21.(Original) The apparatus recited in claim 20, wherein each said induction coil is wound on a magnetically impermeable core.

22.(Original) The apparatus recited in claim 20, wherein each said induction coil is wound on a magnetically permeable core.

23.(Original) The apparatus recited in claim 19, wherein said at least two sensors comprise magnetometers.

24.(Original) An apparatus for excluding ferromagnetic objects from proximity to an MRI instrument, comprising:

- a portal structure, said portal structure having at least first and second vertical members, one of said vertical members being arranged on each side of a passageway adapted for passage of a recumbent human subject, said portal structure having a horizontal member spanning said passageway between said first and second vertical members;

- an array of sensors arranged horizontally on said horizontal member, said sensor array being adapted to detect an induced magnetic field caused by magnetization of a ferromagnetic object by an external magnetic field, said sensor array being adapted to distinguish between a background magnetic field and said induced magnetic field of said ferromagnetic object, said sensor sub-array being arranged above said passageway, at a height above, but in close proximity to, a selected height at which said recumbent human subject will pass through said portal structure; and

- a processor adapted to interpret signals from said sensor array to detect said ferromagnetic object according to said induced magnetic field.

25.(Original) The apparatus recited in claim 24, wherein:

- said horizontal member has a scanning position spanning said passageway at an intermediate height relative to said first and second vertical members, said scanning position limiting the clear height of said passageway between said first and second vertical members to said intermediate height; and

- said horizontal member has a non-scanning position, said non-scanning position not spanning said passageway at said intermediate height, said non-scanning position increasing said clear height of said passageway to allow passage of an upright human subject through said portal structure.

26.(Original) The apparatus recited in claim 25, further comprising first and second vertical sensor arrays, wherein:

said first vertical sensor array is arranged vertically on said first vertical member;

said second vertical sensor array is arranged vertically on said second vertical member;

and

when said horizontal member is in said non-scanning position, said first and second vertical sensor arrays are adapted to scan said upright human subject passing through said portal structure.

27.(Currently Amended) The apparatus recited in claim 19, further comprising: ~~An apparatus for excluding ferromagnetic objects from proximity to an MRI instrument, comprising:~~

~~a hand held frame;~~

~~a magnetic field source mounted on said hand held frame;~~

~~an array of at least two sensors mounted on said hand held frame, said array of sensors being adapted to detect an induced magnetic field caused by magnetization of a ferromagnetic object by a magnetic field from said source, said at least two sensors being arranged symmetrically relative to said magnetic field source, said at least two sensors being connected to cancel out their respective signals resulting from exposure to the flux of said magnetic field source;~~

a processor adapted to interpret signals from said sensor array to detect said ferromagnetic object according to said induced magnetic field.

28.(Original) The apparatus recited in claim 27, wherein said source of said magnetic field comprises a permanent magnet.

29.(Original) The apparatus recited in claim 27, wherein said source of said magnetic field comprises an electromagnetic coil.

30.(Original) The apparatus recited in claim 29, wherein said electromagnetic coil is driven by a DC source.

31.(Original) The apparatus recited in claim 29, wherein said electromagnetic coil is driven by an AC source.

32.(Original) The apparatus recited in claim 31, wherein said AC source operates at a frequency less than 1000 Hz.

33.(Original) The apparatus recited in claim 27, wherein said at least two sensors comprise induction coils.

34.(Original) The apparatus recited in claim 33, wherein each said induction coil is wound on a magnetically impermeable core.

35.(Original) The apparatus recited in claim 33, wherein each said induction coil is wound on a magnetically permeable core.

36.(Original) The apparatus recited in claim 27, wherein said at least two sensors comprise magnetometers.

37. - 41.(Cancelled)

42.(Previously Presented) The apparatus recited in claim 6, wherein:
said object is a “soft” ferromagnetic object; and
said magnetic field comprises an induced magnetic field caused by magnetization of said ferromagnetic object by an external magnetic field.

43.(Previously Presented) The apparatus recited in claim 42, further comprising at least one source of said external magnetic field mounted on said portal structure.

44.(Previously Presented) The apparatus recited in claim 43, wherein said at least one source of said external magnetic field comprises at least one permanent magnet.

45.(Previously Presented) The apparatus recited in claim 43, wherein said at least one source of said external magnetic field comprises at least one electromagnetic coil.

46.(Previously Presented) The apparatus recited in claim 45, wherein said at least one electromagnetic coil is driven by at least one DC source.

47.(Previously Presented) The apparatus recited in claim 45, wherein said at least one electromagnetic coil is driven by at least one AC source.

48.(Previously Presented) The apparatus recited in claim 47, wherein said at least one AC source operates at a frequency less than about 1000 Hz.